Lobachevskii Journal of Mathematics 2016 vol.37 N3, pages 360-367

Local transition to turbulence behind an obstacle for a nominally laminar flow

Mazo A., Okhotnikov D.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016, Pleiades Publishing, Ltd.The mechanisms of transition to turbulence in the middle wake behind an obstacle on the channel wall for a laminar flow have been studied. Using DNS, it has been shown that the transition to turbulence is mainly caused by the interaction of paired helical vortices generated at the side walls of the channel behind the rib. If the transverse size of these vortices reaches a half of the channel width, their contact causes periodic generation and separation of smaller vortex structures in the interaction area; here, the middle wake behind the obstacle is characterized by transition to turbulence. If the channel width is sufficiently large, the flow remains laminar. The influence of the distance between the side walls on the laminar-turbulent transition for Reynolds numbers ranging from 1500 to 3000.

http://dx.doi.org/10.1134/S1995080216030045

Keywords

channel flow, direct numerical simulation, helical vortices, laminar-turbulent transition, nominally laminar flow